



# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Aerospace Forces*

## **Materials and Manufacturing Directorate**

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### ***Nondestructive Inspection***

Air Force engineers, working with the Boeing Company, have demonstrated to the United States Auto Club (USAC) a highly accurate process for revealing hidden flaws and damage to composite bodies of Indy-type racing cars. The Mobile Automated Scanner (MAUS), originally developed for portable nondestructive inspection of Air Force weapon systems, provides accurate and thorough nondestructive inspection of racecars to determine body material integrity, to assess the true extent of damage after a crash.

The MAUS uses pulse echo and resonance ultrasonics to identify subsurface flaws and hidden damage in organic composite structures. The scanner was originally developed by Boeing Phantom Works, of St. Louis, Mo., under a contract with the Air Force Research Laboratory's Materials and Manufacturing Directorate. It was designed to identify flaws and damage in large composite aircraft structures as well as composite airframe components on advanced aircraft.

Indy-type racing cars compete from Australia to Europe, from Pocono and Detroit to Phoenix and Long Beach, for nearly 10 months a year. While they originally raced only on oval tracks such as the Indianapolis 500 speedway, recently road circuits have been added which, while providing more interest, also add opportunities for collisions and crashes. When racing car bodies were all metal and bolted onto a frame they could be repaired by welding, riveting or simply banging out. Today's monocoque racing cars combine the frame and body much like an aircraft fuselage, and are made largely of composite materials chosen for weight savings and strength. In a crash, the body does not dent but may show structural disbanding and cracks and the full extent of damage may not be readily visible. When hidden damage is identified



through a rudimentary tap test the bad spot is cut out, a composite repair is bonded in place, and the car is put back out on the track. As crashes and repairs mount up, the integrity of the vehicle gradually deteriorates, it becomes torsionally unstable while going through turns, and is eventually unfit for competition.

As racing speeds continue to increase, sanctioning bodies such as the USAC are concerned for driver safety and want to increase it through improvements in assuring the integrity of the racecar body. This requires more dependable and thorough methods of inspection. The MAUS unit has been demonstrated to USAC at several racing events, successfully inspecting the internal chassis bondline status of the composite material in the bodies of Indy cars.

For more information on the Materials and Manufacturing Directorate  
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